SL1 Mid-Year Final – Paper 2 MS

1. Al $\frac{20.3}{26.98}$ Cl $\frac{79.70}{35.45}$ or similar working *(no penalty for use of 27 or 35.5)*;

empirical formula $AlCl_3$;

molecular formula: n = $\frac{267}{133.5}$ = 2;

Al_2Cl_6;

*Full credit can be obtained if the calculations are carried out by another valid method. Two correct formulas but no valid method scores **[2 max]**.*

[4]

2. $n(Fe_2O_3) = 30\times10^3 \div 159.7 / n(Fe_2O_3) = 188$ mol;

$n(C) = 5.0\times10^3 \div 12.01 / n(C) = 416$ mol;

Fe_2O_3 is the limiting reagent or implicit in calculation;

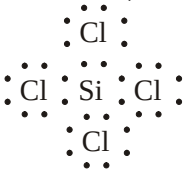
$n(Fe) = 2\times n(Fe_2O_3) = 2\times188 = 376$ mol;

$m(Fe) = 376\times55.85 = 21$ kg;

Accept 2 sig. fig. or 3 sig. fig., otherwise use [1](SF).
*Correct final answers score **[5]**.*
Allow ECF.

[5]

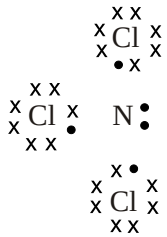
3. Si—Cl bonds are covalent; 3



Accept lines for electron pairs.
*Award **[1]** for covalent bonds and **[1]** for lone pairs.*

[3]

4.



All electrons must be shown.
Accept molecular structures using lines to represent bonding and lone electron pairs.

bond angle: 107 [1] 109 [1]

greater repulsion between lone pair and bonding pairs/OWTTE; 3

NOT between electron pairs and atoms.
*Award **[1 max]** if lone pair missed on nitrogen, ECF for bond angle of 120.*

[3]

5. (a) (i) the ability of an atom to attract a bonding pair of electrons;
inert/do not react/do not attract electrons/stable electron configuration/full outer electron shell/do not form bonds; 2

(ii) electronegativity increases (along period 3 from Na to Cl);
number of protons increases/nuclear charge increase/core charge increase/size of atom decreases; 2

Do not accept "greater nuclear attraction".

(iii) Cl_2 stronger oxidising agent;
Cl_2 has greater attraction for electrons/has a higher electron affinity; 2

Accept converse statements for Br_2.

(b) MgO [1] basic oxide/alkali;
$MgO + 2HCl$ [1] $MgCl_2 + H_2O$/$MgO + H_2O$ [1] $Mg(OH)_2$;
Al_2O_3 [1] amphoteric oxide/acidic and basic oxide;

$Al_2O_3 + 6HCl \rightarrow 2AlCl_3 + 3H_2O$;

$Al_2O_3 + 2OH^- + 3H_2O \rightarrow 2Al(OH)_4^-$/$Al_2O_3 + 2OH^- \rightarrow 2AlO_2^- + H_2O$;

P_4O_6 → acidic oxide;

$P_4O_6 + 6H_2O \rightarrow 4H_3PO_3$; 7

All equations must be balanced.

[13]

6. Al → 2,8,3;
N → 2,5;
F → 2,7; 2

*Award **[2]** for three correct, **[1]** for two or one correct.*
Accept correct configuration using s,p,d notation.

[2]

7. (a) atom of same element/same number of protons but with different mass number/number of neutrons; 1

(b)

protons	23
electrons	23
neutrons	27

2

*Three correct **[2]**, two correct **[1]**.*

(c) $^{51}_{23}V$ /51 nearer to A_r value of 50.94; 1

(d) carbon, 12/^{12}C; 1

[5]

8. (a)

	an atom of ^{79}Br	an ion of $^{81}Br^-$	
protons	35	35	;
neutrons	44	46	;
electrons	35	36	;

3

(b) ^{79}Br because A_r is closer to 79/*OWTTE*; 1

(c) (i) 2,8,8,2/2.8.8.2; 1

(ii) $CaBr_2$; 1

[6]